GREENING FIRE SUPPRESSION SYSTEMS

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To date, most environmental efforts within the fire suppression industry have involved specialized systems including foaming agents, carbon dioxide and clean agents, and national and local green building initiatives have largely overlooked available opportunities related to traditional fire suppression systems. Moving forward, we should begin to seek ways to reduce the environmental impacts of all fire suppression systems during design and testing.

Foaming Agents

Foam concentrates and expanded foams are generally safe with regard to exposure to humans but, unless specifically indicated, can impact the environment if allowed to flow freely into watershed areas.

The base properties of typical foaming agents include nitrates, phosphorous and organic carbon, which can act as fertilizer and promote unwanted plant growth in ponds and streams, and may also be toxic to animal life. Because dissipated foaming agents take time to biodegrade, sewage treatment facilities should be contacted prior to conducting discharge tests. Alternatively, renting a tanker truck to properly dispose of the discharge will ensure that the foam does not get into the water supply system. In any case, the manufacturer should be contacted for information on proper handling and discharge containment.

Newer systems that use less water and biodegradable foams are being developed and should be considered as well.

Clean Agents

The use of halons in fire suppression systems was phased out in the early 1990s to comply with the Montreal Protocol because they were determined to cause significant damage to the ozone layer. In addition, they have a long life in the atmosphere and a high global warming potential (GWP). Hydrofluorocarbons (HFCs)—which have zero ozone depletion potential—were provided as an alternative but their GWP, while a significant improvement over halons, is substantial enough to have raised some major concerns of late. According to the 2007 Intergovernmental Panel on Climate Change assessment

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report, commonly manufactured HFCs have an atmospheric lifetime of approximately thirty years and a GWP of 3,200. This raises the possibility that HFCs may follow halons in being restricted or even banned in the future.

Inert agents such as argon may generally be considered to have a minimal environmental impact. Carbon dioxide (CO_2) is also available, but it is widely recognized as a global warming agent and there have been recent efforts by the U.S. Environmental Protection Agency to limit its use. Proponents argue that CO_2 is a natural byproduct of other processes and reusing it as a fire suppressant is practical and efficient. Typical disadvantages to the use of inert agents are that their discharge reduces oxygen concentration—a potentially serious threat to occupant health and safety—and that systems employing them may take up significant floor area and require special construction such as pressure relief vents in enclosed spaces.

There are therefore two primary factors to consider with regard to clean agents: achieving a safe and effective fire suppression system without increasing a facility's carbon footprint, and minimizing lifetime costs by avoiding systems that may need extensive modifications or replacement to meet future regulatory requirements.

Automatic Sprinkler Systems

The most effective means of addressing environmental impact and sustainability is through design and construction, and automatic sprinkler systems are well-established in terms of both design and effectiveness.

An optimized sprinkler system design effectively uses the available water source, requires the minimal necessary number of components, and employs techniques and technologies that make it adaptable to future building modifications. Minimizing variations in piping can reduce construction waste and promote more efficient installation, and may eliminate the need for a fire pump and reduce water waste. Even though fire pumps only run intermittently, providing a more efficient engine will reduce their environmental impact in terms of both exhaust and noise. In addition, the proper design of the valve or pump room—including proper insulation and efficient heating systems to prevent freezing—can maximize the life of the system and ease future modifications.

Other items to review in the design of automatic sprinkler systems include proper connections for flow and flow testing. For example, fire pumps may be provided with recirculation loops and circulation relief valves to avoid over-pressurization or discharge relief back to a supply tank or greywater tank. Provided that the local authorities permit the use of water meters instead of discharging hose streams, this should save water during system tests and may allow the waste water to be reclaimed (the greywater tank designer and fire protection engineer should determine if the tank is large enough for this purpose and can accept the installation of a simple hose connection). Additionally, flexible connections and arm-overs can be used to provide a means for easily relocating sprinklers with minimal need for additional materials if the system designer incorporates appropriate flow restrictions due to friction losses.

Summary

Fire protection systems serve the purpose of life safety and should never be comprised. However, just like any other building system, they can be designed, sourced, installed and maintained in a manner that reduces their impacts on the environment. ◆

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